

T04D08 – SL Bonding Exam MS

1.	D (6)	IB Chem SL1			Free Response Section (Paper 02)													
2.	B (4)	Level:	MC	FR	Grade	Possible	3	4	5	6	7	Cutoff						
3.	D (5)	Above +6	0%	0%	2	0	50%	0	40%	1.6	30%	3.6	20%	1.6	10%	0.4	7	
4.	C (6)	Above +5	10%	10%	3	0	80%	0	50%	2	40%	4.8	30%	2.4	20%	0.8	10	
5.	B (6)	Above +4	20%	20%	4	4	90%	0	80%	3.2	50%	6	40%	3.2	30%	1.2	14	BELOW
6.	B (4)	Above +3	35%	30%	5	12	95%	0	90%	3.6	80%	9.6	50%	4	40%	1.6	19	STANDARD
7.	B (5)	Above +2	45%	40%	6	8	100%	0	95%	3.8	90%	10.8	80%	6.4	50%	2	23	ABOVE
8.	B (6)	Above +1	50%	50%	7	4	100%	0	100%	4	95%	11.4	90%	7.2	80%	3.2	26	
9.	A (4)	Level	80%	80%	Multiple Choice Section (Paper 01)													
10.	B (4)	Below -1	90%	90%	Grade	Possible	3	4	5	6	7	Cutoff						
11.	B (6)	Below -2	95%	95%	2	0	50%	0	45%	2.25	35%	0.7	20%	1	10%	0	4	
12.	B (4)	Below -3	100%	100%	3	0	80%	0	50%	2.5	45%	0.9	35%	1.8	20%	0	5	
		Below -4	100%	100%	4	5	90%	0	80%	4	50%	1	45%	2.3	35%	0	7	BELOW
		Below -5	100%	100%	5	2	95%	0	90%	4.5	80%	1.6	50%	2.5	45%	0	9	STANDARD
		Below -6	100%	100%	6	5	100%	0	95%	4.75	90%	1.8	80%	4	50%	0	11	ABOVE
		Below -7	100%	100%	7	0	100%	0	100%	5	95%	1.9	90%	4.5	80%	0	11	

13. (i) (5x3) 3

Allotrope	Structure
Diamond	3D array/network involving tetrahedral carbons/each carbon atom joined to four others;
Graphite	layer structure involving trigonal (triangular) planar carbons/with each carbon atom joined to three others/with hexagonal (six-membered) rings of carbon atoms;
C ₆₀ fullerene	truncated icosahedrons; <i>Accept carbon atoms form a 'ball' with 32 faces, of which 12 are pentagons and 20 are hexagons, exactly like a soccer ball. Do not accept soccer ball alone.</i>

- (ii) (5x1)Diamond: covalent bonds (only);
(5x1)Graphite: covalent bonds and the separated layers held together by (weak) London/van der Waals'/dispersion forces;

2

[5]

14. (6x1)NH₄⁺ > NH₃ > NH₂⁻;

(7x1)NH₄⁺ has four bonded electron pairs (and no lone electron pairs);

(7x1)NH₃ has three bonded electron pairs and one electron lone pair;

(7x1)NH₂⁻ has two bonded electron pairs and two electron lone pairs;

Accept correct Lewis structures with lone electron pairs clearly shown.

(6x1)lone pair-lone pair > lone pair-bonded pair > bonded pair-bonded pair/

lone pairs of electrons repel more than bonding pairs of electrons/OWTTE;

Do not accept repulsion between atoms.

5

[5]

15. (5x1)delocalized electrons;

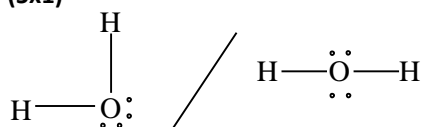
(5x1) (attracted) to positive ions;

(6x1)more delocalized/mobile/outer shell electrons/higher ionic charge;

3

[3]

16. (5x1)



Allow a combination of dots, crosses or lines.

(4x1)bent/V shaped/angular

(4x1)104.5°;

Accept answers in range 104° to 106°.

(6x1)repulsion of the two non-bonding pairs of electrons forces bond angle to be smaller/non-bonding pairs repel more than bonding pairs;

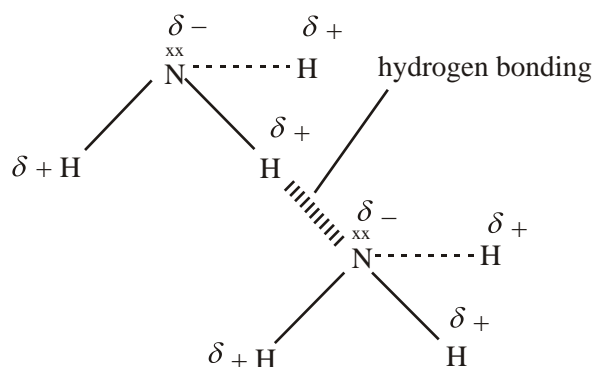
4

[4]

17. (a) (i) **(5x2)** (relative) measure of an atom's attraction for electrons; in a bond;

2

(ii)



Suitable diagram indicating

(7x1) dipoles;

(4x1) lone pairs of electrons;

(6x1) hydrogen bonding;

(iii) **(4x1)** 107°;

3

1

Accept answer in range 107 to 109°.

(iv) **(5x1)** molecule is asymmetrical/OWTTE;

1

(b) (i) **(6x1)** 109.5°;

1

(ii) **(6x1)** NH_4^+ has four bonding pairs

(around central atom so is a regular tetrahedron);

(6x1) NH_3 has three bonding pairs (of electrons) and one non-bonding pair;

(5x1) non-bonding pairs (of electrons) exert a greater repulsive force;

3

Accept suitable diagrams.

[11]